

College of pharmacy /Al-Nahrain University

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Pharmacognosy I

2nd stage / 2nd coarse

Lecture 1

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MSc pharmacognosy

Introduction to Pharmacognosy

- Pharmacognosy is one of the **oldest pharmaceutical sciences** and forms the **foundation of drug discovery from natural sources.**
- The term Pharmacognosy comes from two Greek (Latin) words: "**pharmakon**" meaning **drug**/ **medicine**, and "**gnosis**" meaning **knowledge.**
- "**PHARMACO-GNOSY**" = "**KNOWLEDGE OF DRUGS**"
- **Pharmacognosy** : is the study of the **physical**, **chemical,** and **biological** properties of **drugs of natural origin.**
- It covers their **identification, evaluation, chemical constituents, biological activity, and therapeutic uses**.
- More than **50% of modern drugs** are either natural or derived from natural sources







Pharmacognosy

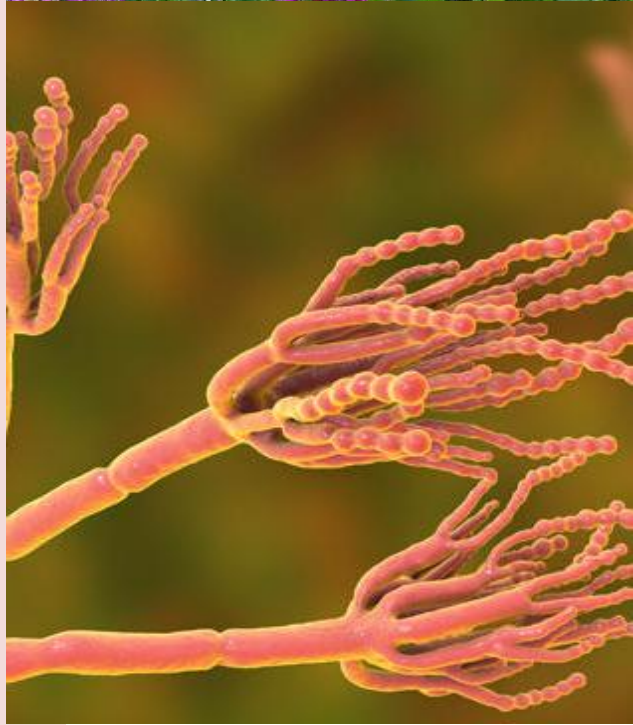
Study of active compounds and medications that are

from natural origin:

plants, animals and microorganisms

- **Many modern drugs:**
- Morphine (Papaver somniferum)
- Digoxin (Digitalis species)
- Quinine (Cinchona bark)
- Paclitaxel (Taxus species)





Examples of drugs from natural products



Digitalis lanata



Hyoscine butyl bromide
Atropa belladona



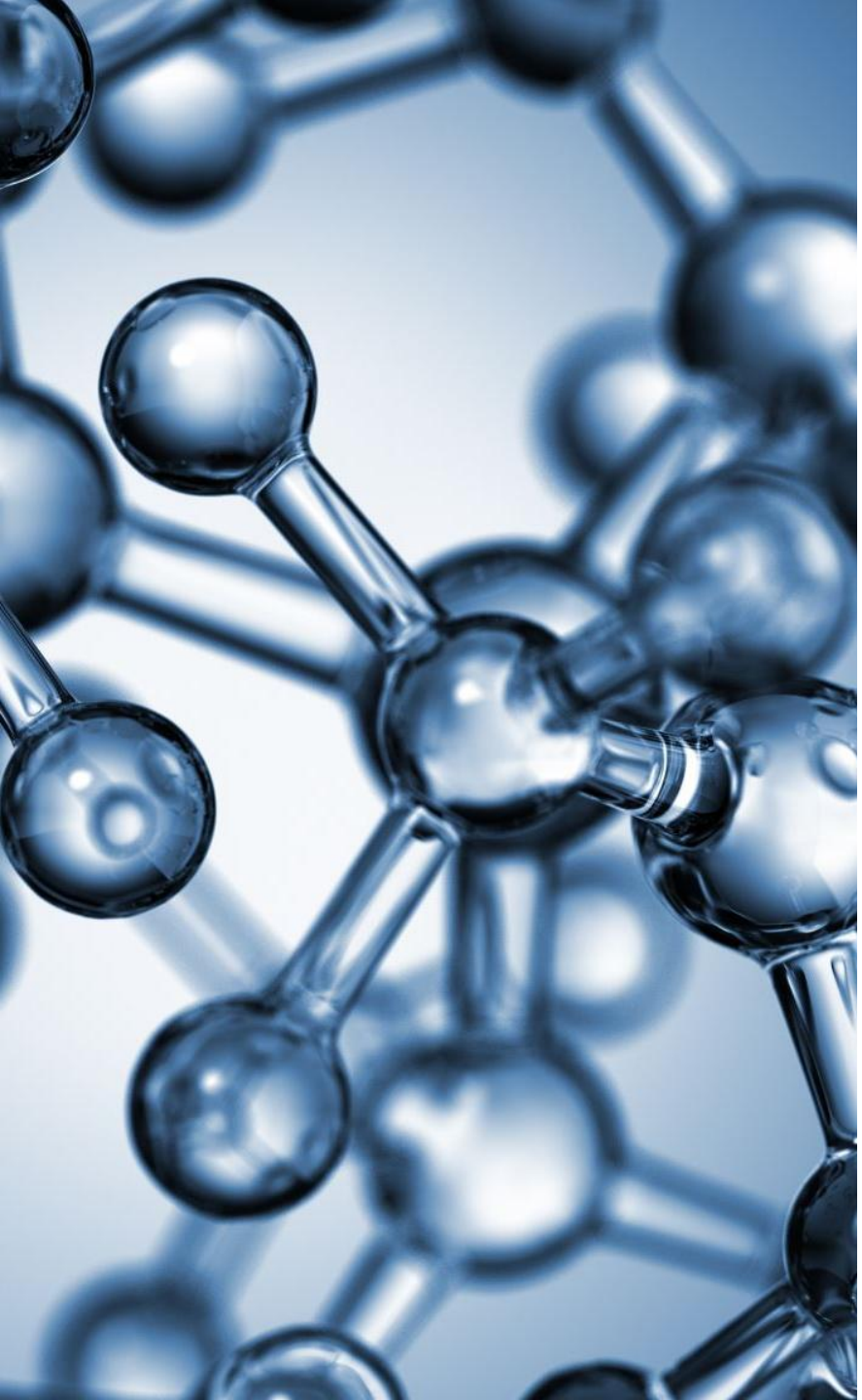
Caffeine and Ergotamine
Fungus : *Claviceps purpurea*
Plant: tea-coffee



Catharanthus roseus



Beta- sitosterol :phytosterol



Drug production

- Pharmacognosy
- Pharmaceutical chemistry
- Pharmacology
- Pharmaceutics
- Clinical pharmacy

Importance of Pharmacognosy in Pharmacy





- **New medications and active ingredients from natural source**
- Source of **new drugs** and lead compounds
- Supports **rational use of herbal medicines**
- Ensures **quality control** of natural products
- Bridges traditional **medicine and modern science**
- Essential for **pharmacists, researchers, and healthcare professionals**
- The **Correct prescription** of natural drug in the treatment of the diseases.

Definitions & Basic Principles in Pharmacognosy

1.Drug: is a **natural** or **synthetic** substance used in the **treatment, prevention, or diagnosis of disease.**

2.Natural substance: this term refers to **those substances that are found in nature (plants, animals &microorganisms).** They **have not change in their molecular structure** when they exposed to some processes like **drying, crushing, grinding and evaporating**.

3.Crude drugs: are **drugs** obtained from natural sources (plants, animal, minerals, microorganisms, marines). They **contain more amount of active constituent.**

Crude drugs





- **Crude drugs** : are the drugs, which are obtained from natural sources like **plant, Animals, minerals, marine, microorganisms** and they are used as such as they occur in nature **without any processing except, drying and size reduction (minimal processing).**
- **Characteristics:**
- Those natural products such as **plants and extracts** which are **not pure compounds.** **It is not chemically purified.** **Ex: dried digitalis leaves,**
- Crude drugs contain **multiple constituents:** ***Activity may be due to synergism***, not a single compound. **Ex: ginger rhizomes**
- Natural products can be :

1-Entire organism (plant, animal, organism) .

2-Part of an organism (a leaf or flower of a plant, an isolated gland or other organ of an animal).

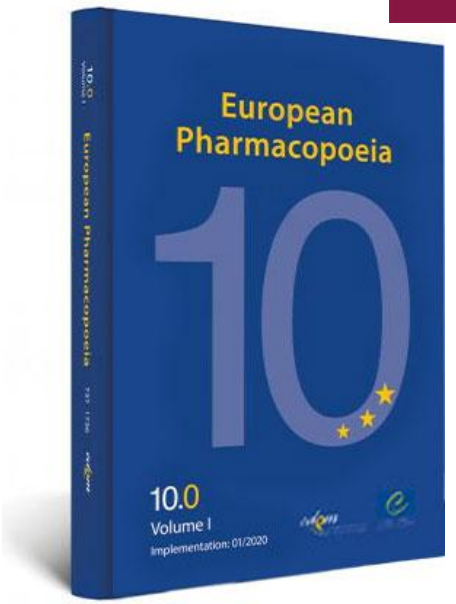
3-An extract or an **exudate** of an organism.

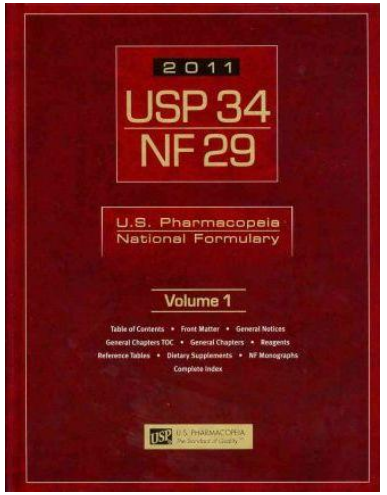
Pharmacopoeia

- **Pharmacopoeia**: is a book containing directions for the **identification of samples** and the **preparation of compound medicines** and publishing by the **authority of a government or medical or pharmaceutical society.**
- Pharmacopoeias are:

1. **BP** (British Pharmacopoeia).
2. **USP** (United States pharmacopoeia).
3. **Ph. Eur**. (European pharmacopoeia).







- **Official drugs**: natural or synthetic drug that **recognized, described, standardized and included by official pharmacopeia. (USP,BP,EP)**
- Has **quality standards (identity and strength defined)** and **accepted for pharmaceutical use.**
- Ex: The juice or **extract of unripe fruit of poppy plants** (Papaver sp.) and its active constituents as **(Morphine)** used as **narcotic**. And **senna leaf (laxative).**



- **Unofficial drugs**: These drugs are **scientifically** known natural, or synthetic, that **have been included** in the official Pharmacopoeia**,** but they are **not found in the current issues** and are **not standardized** , because **those drugs by the time are being have toxic effects and replaced by safer alternatives.**
- Ex: **Khat plant** which used in Yamen country as **a narcotic.**



- **Non - official drugs**: such kind of drugs are **never appeared in an official pharmacopoeia. But still used in traditional medicine. Lack scientific evidence.**

What you see in pharmacy	Pharmacognosy classification
Prescription drugs	Official drugs
OTC medicines	Official drugs
Herbal medicines (registered)	Official or semi-official (**STANDARDIZED**)
Dietary supplements	Mostly non-official
Traditional herbal products	Non-official or unofficial



Supplements: Where Do They Fit?





- Most supplements are:
- **Plant extracts / Vitamins/ Minerals/ Herbal mixtures**
- In Pharmacognosy: Mostly non-official drug, Sometimes unofficial, Rarely official (unless pharmacopoeia grade)
- Why are they NOT official drugs: **No requirement for:**
- **Clinical trials**
- **Therapeutic claims (clear indication)**
- **Strict dose standardization**

Example : Turmeric	
Form	classification
Turmeric powder (traditional)	Non-official
Curcumin supplement	Un-official
Purified curcumin drug (if approved)	Official drug
Same plant but different regulatory status	

Supplement

- Examples:
- Weight loss herbs
- Energy boosters
- Memory enhancers
- **Problem:**
- **No clear dose**
- **No therapeutic indication**
- **Possible drug–herb interaction**



Extraction

- Extraction is a method of **obtaining the active components found in natural source**.
- Extraction is the process of **separating the desired medicinally active constituents** from **crude drugs using suitable solvents.**
- It is the **first and most critical step** in studying natural products. Without extraction, No morphine No caffeine ,No quinine
- Extraction is based on **Solubility of constituents in solvents** and **Polarity differences between compounds**.
- Extraction **removes only those substances** that can be **dissolved** in the **liquids** (single or mixture) which are referred as solvents (water, ethanol, chloroform, etc).
- **Extract**: Is a substance made by extracting a part of a raw material, often by using a solvent such as Ethanol or Water.
- **Undissolved portion** of the plant that remains after the extraction processes is completed called **marc.**
- **Solvent** used after extraction is called **extract** and the product of the extraction process is known as **extractive.**
- **Extractives**: the **principal constituents** of natural substance which give natural drug its **pharmacological activities**, these found as single or mixtures and used as therapeutic agents,
- for example, **Caffeine alkaloid is extracted from leaves of tea plants**

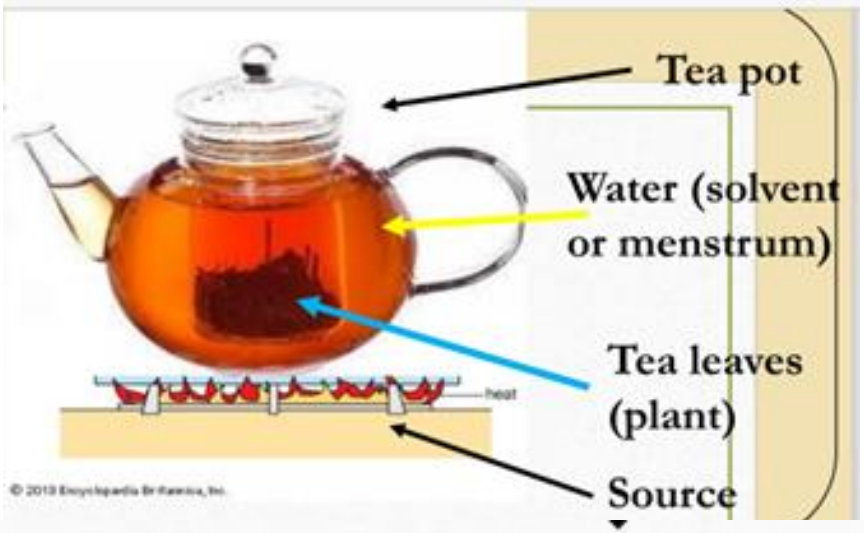
Extraction of Caffeine from Tea leaves



Extractives

Principle constituents of natural substance.

Ex: Caffeine alkaloid.

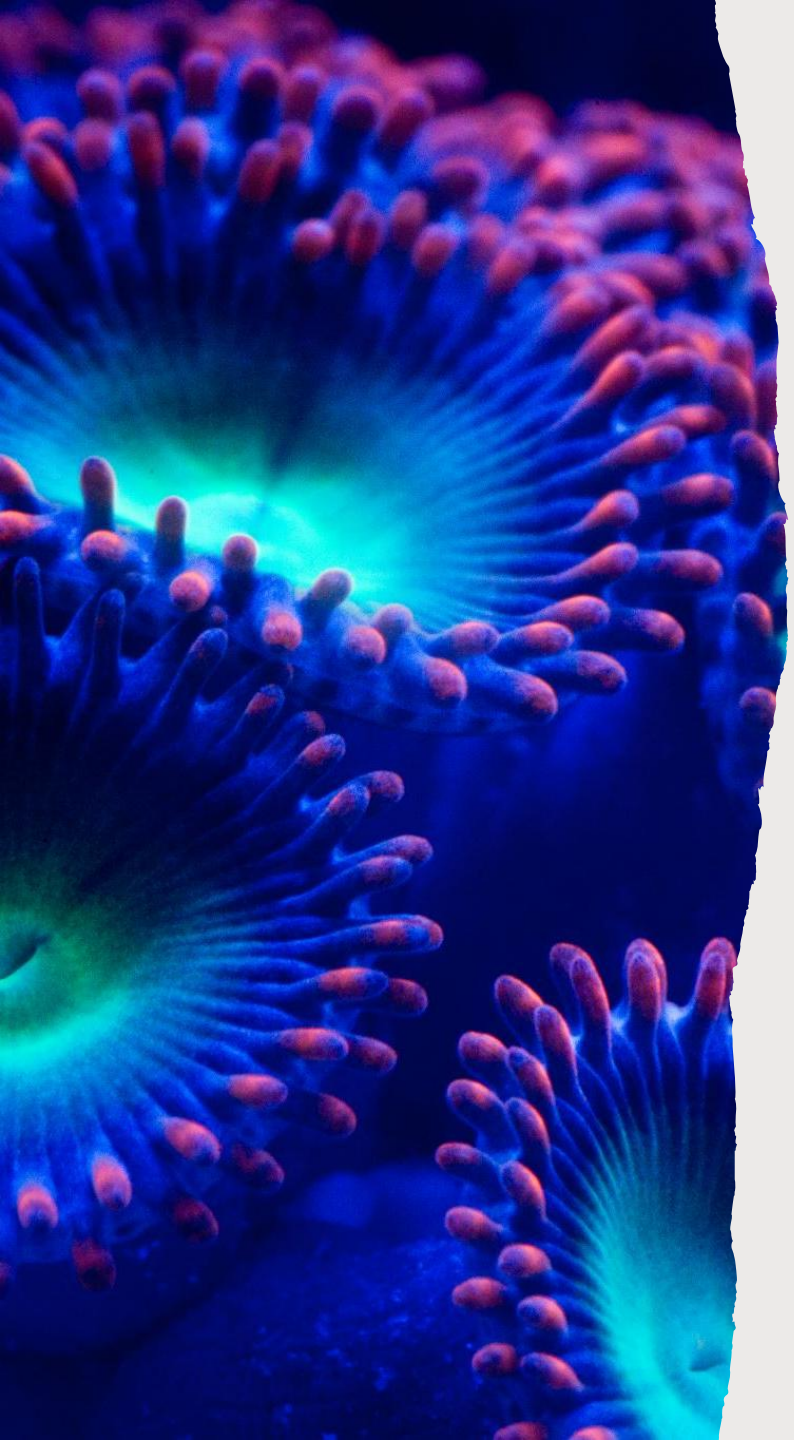


Marc

(Undissolved plant material without active components)







Classification of natural products

- The most important natural sources of drugs are (higher plants microbes & animals and marine organisms.
- To follow the study of the individual drugs , one must adopt some sequence of arrangement, and this is referred to a system of classification of drugs.
- <u>To study the drugs are classified in the following different ways :</u>

1. Alphabetical classification.
2. Morphological classification
3. Chemical classification
4. Taxonomic classification
5. Chemo - taxonomical classification
6. Pharmacological classification

Pharmacological classification

- In Pharmacological classification the crude drugs are grouped **according to pharmacological action** (Therapeutic action) of their chief active constituent (most important) or therapeutic uses.

- **Advantages**

- The special advantage is that if **even chemical constituents of the crude drugs are not known** they can be classified properly based on therapeutic or pharmacological uses.

- **Disadvantages**

- **Regardless of morphology, taxonomical status or chemical nature**, the drugs are grouped together, provided they **exhibit similar pharmacological uses.**

- **For example: Senna, Castor oil,** are grouped together as **purgatives/laxatives** because of their common pharmacological action.



History of Pharmacognosy



- **Ancient civilizations** relied almost entirely on natural remedies: **Egyptian** medicine (Ebers Papyrus), **Chinese** medicine, **Indian** and **Greek** medicine (Hippocrates)
- Plants have been the primary sources of medicines and have an advantage over other sources **in drug discovery**.
- Knowledge was preserved and expanded by **Arab and Islamic scholars** where the Introduction of **Distillation**, **Extraction** techniques, Organized **drug preparation.** Many pharmaceutical terms and techniques originated in this era.
- **Modern pharmacognosy** : The first isolation was reported in the beginning of the 19th century, isolated in **1803** by a French apothecary & it was found to be **narcotine**.
- Then comes **Friedrich Serturner** in **1806** who isolated **morphine** from opium.
- The term 'Pharmacognosy' was used firstly (1815) by a German C.A. **Seydler** (**the father of pharmacognosy**) in his book named **Analecta Pharmacognostica**.

Egyptians (Ebers's papyrus, 1550 BC)



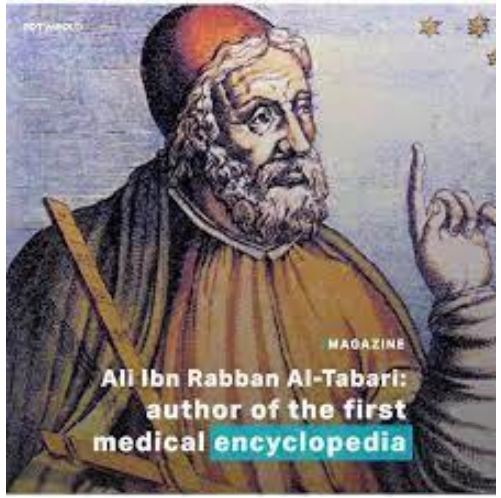
Is an ancient Egyptian book of herbal knowledge

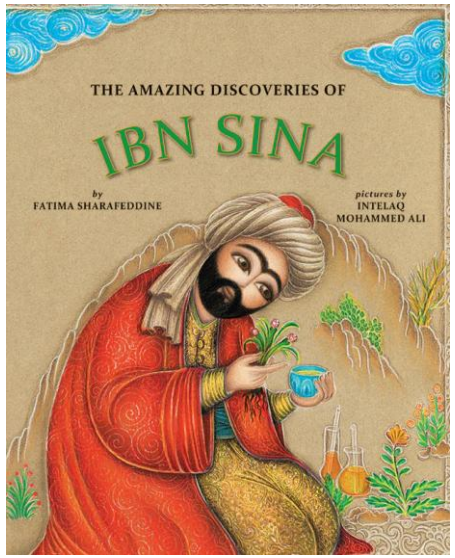






The Islamic era





- Ibn Altabari "فردوس الحكمه"
- Ibn Sina" "القانون في الطب"Ibn Albitar (1148-1197) " الجامع لمفردات الأدوية والأغذية



Nomenclature :Rules of Writing a Scientific Name

- Binomial terminology divides a species' scientific name into two parts: **the generic name** and the **specific name (species)**.

- **The taxonomic genus** is considered as the **generic name**.. The specific name is the second component of the binomial name. The **second name, often known as the specific name**, **distinguishes a species from the remainder of the genus's species**
- While writing a scientific name, **the genus of the organism comes first followed by the species.**
- While typing a scientific name, it is always typed **in Italics** and, it is always **underlined.**
- **The GENUS name is CAPITALIZED** followed by the **species name** which is in **lower case.**
- ***Erythroxylum coca***
- ***Digitalis purpurea***
- ***Digitalis lanata***
- ***Atropa belladonna***

Thank you

